1046-76-1789 **Russel E Caflisch*** (rcaflisch@ipam.ucla.edu), 460 Portola Plaza, Los Angeles, CA 90095-7121. *Accelerated Computational Methods for Fluid and Plasma Dynamics.*

We present accelerated simulation methods for rarefied gas dynamics (RGD) and Coulomb collisions in a plasma. We describe a hybrid method that combines a Monte Carlo particle simulation and a fluid dynamic solver in a single uniform method throughout phase space. The hybrid method is based on a representation of the velocity distribution function $f(v)$, as a combination of a Maxwellian equilibrium $M(v)$ and a collection of discrete particles $g(v)$. The Maxwellian M evolves in space and time through fluid-like equations, and the particles in g convect and collide through a standard Monte Carlo particle method, such as DSMC for RGD or Nanbu's method for Coulomb collisions. Interactions between M and g are represented by a thermalization process that removes particles from g and includes them in M and a dethermalization process that samples particles from M and inserts them into g. We also discuss renormalization group procedures to describe fluctuations in plasmas. (Received September 17, 2008)